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Bat Monitoring in the Western Mojave Desert

Bureau of Land Management, Ridgecrest Field Office
October, 2003
Morgan Ruelle, Kevin Keith

In 2001, a Desert Monitoring Team was hired by the Bureau of Land Management (BLM) to monitor the effects of Off-Highway Vehicles (OHV's) on the desert ecosystem. Abandoned mines have a widespread distribution in the Mojave Desert, and many of these mines now serve as bat habitat. One of the team's tasks was to develop a long-term monitoring plan for bats in areas where OHV recreation takes place. The team biologist developed a three-part protocol: 1) pre-surveys of abandoned mines to assess the likelihood of use of each mine feature by bats, 2) portal surveys to detect use of abandoned mines by bats, and 3) bat species identification by analyzing ecolocation calls collected at water sources.

In 2003, the team biologist began monitoring for bats based on this protocol. This document is divided into the following sections:

Part I: The Protocol

Statement of Purpose page 2
Objective page 2
Methods page 3
Materials page 5
Goals for Winter 2002/2003 page 7
Preliminary Budget 2002/2003 page 8

Part II: Results from 2003

Pre-survey results: High priority adits page 9
Pre-survey results: High priority shafts page 9
Mines used by bats page 10
Species identified by acoustic surveys page 11

Part III: Raw Data from 2003

Pre-survey Adit Visits page 12
Pre-survey Shaft Visits page 13
Pre-survey Prospect Visits page 14
Bat Outflight Counts: All Features page 17
Anabat Survey: Survey Nights page 17
Anabat Survey: Species Code Summary page 18
Anabat Survey: Species and Call Time Summary page 18

Protocol for long-term monitoring of bats in the Ridgecrest Resource Area

Morgan Ruelle
January 12, 2003

Statement of Purpose:

Detecting and Describing Mines:

The Ridgecrest Field Office (RFO) of the Bureau of Land Management (BLM) oversees public lands that contain high concentrations of abandoned mine sites. Many of these lands are popular for outdoor recreation, and abandoned mines pose a threat to visitors. The BLM considers fencing, gating, or otherwise closing any mine that endangers the public.

The BLM also considers wildlife that makes use of abandoned mines. Although many animals use mines, some bats are reliant on mines as roost sites. Nine of the ten bat species known to occur in the Ridgecrest Resource Area roost in abandoned mines. Four of these species are identified as sensitive species by the BLM, and the California Department of Fish and Game (CDFG) lists two of these as Species of Special Concern:

- Pallid bat, *Antrozous pallidus* (BLM, CDFG)
- Townsend's western big-eared bat, *Corynirhinus townsendii* (BLM, CDFG)
- Small-footed myotis, *Myotis ciliolabrum* (BLM)
- Fringed myotis, *Myotis thysanodes* (BLM)

The RFO lacks an inventory of abandoned mines within the Resource Area. In the interests of public safety and bat conservation, this inventory is high priority. RFO staff and contract biologists shall visit abandoned mines throughout the Ridgecrest Resource Area and conduct "external pre-surveys" to evaluate safety hazards and potential bat habitat.

Monitoring Bats in Mines:

Before considering mine closures, the RFO shall monitor populations of bats that use mines. RFO staff and contract biologists shall review the abandoned mine inventory data to identify sites with potential bat habitat. To determine if and when bats use these sites, RFO staff and/or contract biologists shall monitor each site over the course of a year. Where bats are found, RFO staff and/or contract biologists shall continue to monitor populations by seasonal "portal counts", using night-vision equipment to tally the number of bats exiting a mine site after sunset.

The RFO shall install "bat gates" at abandoned mines that house significant populations of bats. These gates allow bats continued access to mines and protect the public from those mines.

Monitoring Bats at Water Sources:

One sensitive bat species occurring in the Ridgecrest Resource Area (the Spotted bat, *Euderma maculatum*, listed by BLM and CDFG) does not often roost in abandoned mines. The most likely places to observe this and several other bat species are water sources. Because water is scarce throughout the Resource Area, biologists anticipate high concentrations of bats at water sources.

RFO staff and contract biologists shall conduct acoustic monitoring of bat activity at water sources to detect bat species composition. The RFO is interested in the effects of off-highway vehicle (OHV) recreation and other human activities on wildlife populations. A time-series comparison of bat species composition in OHV recreation areas and wilderness areas shall detect any trends in bat populations and distributions. By monitoring bats in mines and bats at water sources, BLM will have better information to effectively manage sustainable recreation in bat habitat.

OBJECTIVE: To establish long-term monitoring of bats in abandoned mines and at water sources throughout the Ridgecrest Resource Area.

NOTE: Current funding restricts monitoring to areas with OHV recreation and wilderness areas used as reference sites. Independent biologists already conduct some monitoring on other BLM lands as mitigation for mine site development. As additional funding becomes available, BLM will begin monitoring bats on all BLM lands.

Detecting and Describing Mines

- A complete inventory of historic mining sites within OHV recreation areas currently funded by the OHMVD grant to the RFO and wilderness areas.
- External pre-surveys to evaluate safety hazards and potential bat habitat.

Monitoring Bats in Mines

- Portal surveys conducted at all sites that show high potential for bat habitat, based on a review of external pre-survey data.

Bats at Water Sources

- Surveys of bat activity at water sources, natural and artificial, within OHV recreation areas currently funded by the OHMVD grant to the RFO and wilderness areas.

METHODS

Detecting and Describing Mines:

Members of the Desert Monitoring Team (DMT) shall work with RFO staff to locate abandoned mines within OHV recreation areas and nearby wilderness areas. The California Department of Mines and Geology (CDMG) has produced a database of Topographically Occurring Mine Symbols (TOMS). This database shall serve as the primary source to lead the DMT to areas of historic mine activity.

Personnel in archeology, mines and lands, and wildlife biology may help identify additional abandoned mine sites. Long-term residents of Ridgecrest, Randsburg, Johannesburg, Red Mountain, Cantil, and Mojave may also help locate and describe abandoned mines. The DMT shall maintain a database of contacts known to have experience with abandoned mines in the Resource Area.

A member of the DMT shall visit and document each mine site. Under no circumstance shall any team member enter a mine. Any entry requires agency certification or the presence of certified mine-safety instructors. The BLM will not permit entry until these requirements are met and a protocol for internal mine survey by an experienced bat biologist is complete.

Written documentation of each site (see the External Pre-Survey Form, Appendix A) includes but is not limited to:

1. Driving directions and the safest approach to the site.
2. UTMs of all openings at the mine complex.
   - UTMs should be obtained in NAD83 with a Geo Explorer III GPS system.
3. Dimensions of all openings (minimum size of 12 x 12").
   - The DMT shall measure the depths of vertical workings by weighting the end of a 100-meter tape measure and lowering it to the bottom of the shaft.
   - The DMT shall estimate the depths of horizontal workings by shining a high-powered flashlight into the adit.
4. Notes on obstructions of each opening (dense vegetation, boards, gates, debris, etc).
5. Temperature outside the mine, at each portal, and within each portal.
6. Notes on visual sign of bats (guano, roosting bats, carcasses, piles of insect parts, etc).
   - Bat guano should be collected into small manila envelopes and sent to a bat biologist (Pat Brown) for identification.
7. Detailed notes on safety hazards at the site, including the condition of barriers installed to prevent human entry.
8. Notes on human activity at the mine site, including evidence of human entry or other disturbance.

Team members conducting external pre-surveys will photograph all features with a digital camera. Photographs should be taken from directly in front of the opening and should show the mine environment

(3 to 5 meters on either side of the opening). Digital images will be stored in the DMT's public folder using the following file-naming convention:

- "MineCode_PortalNumber_Date". For example, a photograph of the third adit at mine site DOS013 taken on September 12, 2002 shall be named: "DOS013_A3_20020912".

Monitoring Bats in Mines:

Prioritization of abandoned mine sites.

RFO staff and contracted biologists will review the external pre-survey data and identify high-priority sites. High priority shall be assigned to sites with high potential for bat roosts that pose significant risk to visitors. Risk to visitors shall be assessed based on access (distance from roads, ease of approach, etc.), levels of visitation, and safety hazards at the site (visibility of workings, depths of shafts, etc.). RFO staff and contracted biologists shall aim to monitor as many high-priority sites as possible in the first year. If no bats are detected within the first year, RFO staff and contracted biologists shall discuss appropriate closure. If bats are detected, RFO staff and/or contracted biologists shall continue monitoring bat populations at the site.

Because bats often use a mine site for only a short time, at least four portal counts shall be conducted of each mine site: once in April or May, once in June, once in August or September, and once in December, January, or February. Depending on the number of mine openings at a site, these counts can require considerable numbers of people (one per opening). Volunteers can often assist with portal counts because these surveys take place in the evening.

Portal Counts:

1. All personnel shall arrive at the mine site at least one hour before dark.
2. A designated recorder shall note moon phase, temperature, wind, and sky conditions upon arrival (see Portal Count form, Appendix B).
    - If it is raining or winds exceed 10 mph, postpone monitoring the mine until the following night.
3. All equipment shall be distributed ½ hour before sunset.
    - All known exit points from a mine shall be watched.
    - Each observer shall have night-vision goggles or scope (Generation III or higher), an infrared light source, and two finger tallies.
4. Each observer shall position her- or himself at least 3 meters, preferably 6 meters, from a mine opening.
    - Personnel shall work quietly to affect the bats as little as possible.
    - Observe the opening from an angle. Do not sit directly in front of the opening.
    - Do not face west. Direct light from the setting sun will affect night-vision equipment.
    - The infrared light source shall be close enough to the observer that it shines into the opening but is not seen through the night-vision goggles (any direct light will obscure bats).
5. Using the night-vision goggles and finger tallies, count the number of bats exiting and entering the opening.
    - On one finger tally, click for every bat that leaves the opening; on the other for every bat that enters or re-enters.
    - Because some bats may enter the mine from another roost after dark, note if there are initially more bats entering than exiting.
6. Watch the mine for one hour after sunset or longer until no bat activity has occurred for twenty minutes.
7. All people shall report their tallies to the designated recorder.
8. The recorder shall record temperature, wind, and sky conditions again before leaving the site.

Alternatively, a video camera with night-vision can be used in place of an observer. The camera and an infrared light source should be set up at an angle to the mine opening. The camera should start recording 5 minutes before sunset. A 90-minute tape will usually document all bat activity. The tape can be reviewed with two finger-tallies after returning from the field.

Monitoring Bats at Water Sources:

The California Department of Fish and Game has conducted a survey of natural springs and artificial wells and guzzlers that may be used by bats. A random subset of natural and artificial water sources in OHV recreation areas and wilderness areas shall be monitored for bat activity. A member of the DMT shall monitor one site per night in a random order. These surveys shall commence at the same month and lunar phase each year, beginning at the first full moon in June.

It is difficult to gauge the number of bats visiting a specific water source, but it is possible to identify bat species visiting a water source by use of an Anabat II system. Anabat II connects via the ZCA Module (ZCAM) to a PC laptop computer. This equipment allows people to listen to and watch sonograms of bat echolocation signals in the field. A trained user can relate a sonogram to a bat species.

1. People shall arrive at the water source at least 1 hour before sunset to set up the Anabat II system.
    1. People and equipment shall be positioned 3 to 5 m from the water's edge.
    2. Anabat software shall be configured for manual tracking and timed automatic saving of sonogram file.
2. Record moon phase, temperature, wind and sky conditions upon arrival.
1. Begin monitoring for bats at least ½ hour before sunset (to detect western pipistrelles and other bats that are active before dark).
2. As personnel begin to pick up bat signals, track the bats across the sky with the Anabat; this can enhance the quality of the record. Each record should be automatically saved.
3. Record bats for at least one hour after sunset or longer until no bats have been observed for twenty minutes.
4. Record temperature, wind and sky conditions at departure.

MATERIALS:

Detecting and Describing Mines:

1. USGS 7.5 minute maps for areas being surveyed
2. Data sheets (External Pre-Survey Form, Appendix A)
3. Geo Explorer III (GPS)
4. Tape measure (100 meter)
5. Flashlight (high power, to shine into adits)
6. Small manila envelopes (for collecting bat guano)
7. Digital camera
8. Extra AA batteries

Monitoring Bats in Mines

1. Completed External Pre-Survey Form for mine site
2. Data sheets (Portal Count form, Appendix B)
3. Geo Explorer III (GPS for navigation)
4. Night vision equipment (one set per observer)
5. Finger tallies (two per observer)
6. Infra-red light source (one per observer)
7. Flashlight or headlamp (one per observer)
8. Digital thermometer
9. Extra AA batteries

Monitoring Bats at Water Sources:

1. Data sheets (Species Counts of Bats at Water Sources, Appendix C)

2. Geo Explorer III (GPS for navigation)
3. Anabat II
4. ZCA Module
5. Digital thermometer
6. PC-compatible laptop
7. Flashlight or headlamp (one per observer)
8. Extra AA batteries

Appendix D: Goals for Winter 2002/2003

Bats in Mines

Before January of 2003, M. Ruelle will locate abandoned mine sites on OHV and wilderness lands managed by the Ridgecrest Field Office. Ruelle will search for mine sites on relevant USGS topographic maps and enter legal descriptions into the "Abandoned Mines Database".

Ruelle's initial search will be limited to areas within Kern County:

1. Jawbone-Butterbredt Area of Critical Environmental Concern (ACEC)
2. Western Rand Mountains ACEC
3. El Paso Mountains Wilderness
4. Kiavah Wilderness

If additional grant funds become available, Ruelle's search will expand to include:

5. Last Chance Canyon ACEC
6. Sand Canyon ACEC
7. Bright Star Wilderness
8. Owens Peak Wilderness

Before March of 2003, the Desert Monitoring Team will aim to visit all adits and any mine sites with more than three surface openings identified in Ruelle's search. The team will conduct external pre-surveys of those sites and complete an External Pre-Survey Form (Appendix A) for each site.

Bats at Water Sources

Before March of 2003, M. Ruelle will use California Fish and Game's inventories of natural and artificial water sources in Kern County to identify all springs, wells, and guzzlers suitable for watering by bats. Ruelle will create a database to describe these sites and select a random subset of these sites to be visited in a random sequence in June and July.

Ruelle will choose sites within the following management areas:

9. Jawbone-Butterbredt Area of Critical Environmental Concern (ACEC)
10. Western Rand Mountains ACEC
11. El Paso Mountains Wilderness
12. Kiavah Wilderness

If additional grant funds become available, Ruelle's study will expand to include:

13. Last Chance Canyon ACEC
14. Sand Canyon ACEC
15. Bright Star Wilderness
1. Owens Peak Wilderness

Appendix E: Preliminary Budget 2002/2003

Equipment needed by DMT for all tasks:

- High-powered flashlight
    - CMG Reactor LED Flashlight, $29.99 at http://www.campmor.com/
- Digital thermometer
    - **Oregon Scientific MTR101 Cable Free Thermometer, $29.99 at** http://www.weathertools.com/

TOTAL COST: **$59.98**

Equipment needed for RFO to conduct portal counts (without contract bat biologists):

- Finger tallies (2 per opening)
    - High-impact Plastic Case Tally Counters, $6.75 at www.tallycounters.com
- Infrared light source (1 per opening)
    - SONY HVL-IRC Nightshot Light, $44.95 at www.bhphotovideo.com
- Night-vision goggles (1 set per opening)
    - AN/PVS-7 Single Tube Night Vision Goggle, $2,775.00 at www.nightvisionweb.com

TOTAL COST: **$2883.45 per opening**

Alternatively, RFO could conduct portal counts with video cameras rather than night vision:

- Finger tallies (2 per opening)
    - High-impact Plastic Case Tally Counters, $6.75 at www.tallycounters.com
- Infrared light source (1 per opening)
    - SONY HVL-IRC Nightshot Light, $44.95 at www.bhphotovideo.com
- Video camera with night-vision capacity (1 per opening)
    - **CCD-TRV108 Hi-8 Handycam Camcorder**, $299.99 at www.bhphotovideo.com
- Video camera tripod (1 per opening)
    - **BR-5CSL Compact 5-Section Branner Tripod, $44.95 at** www.bhphotovid00eo.com

TOTAL COST: **$403.39 per opening**

RFO has invested in one Anabat II/ZCAM system. This system will only function in the field with an **IBM-compatible laptop computer** with a 386 processor. This laptop only needs to run in DOS mode.

Estimated time required per task:

External pre-surveys: **20 minutes** per opening plus transit time (driving and approach on foot)
Portal counts: **3 hours** per opening per visit or **12 hours** per opening per year plus transit time
Acoustic surveys at water sources: **2.5 hours** per water source per survey plus transit time

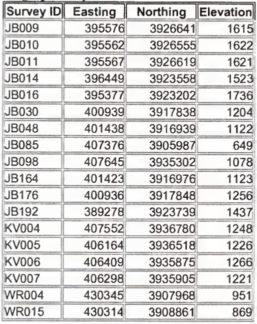
Bat Survey Summary: 2002-2003

Morgan Ruelle, October 15, 2003

During the winter of 2002-2003, I conducted external pre-surveys at most topographically occurring mine symbols (TOMS) in the Jawbone-Butterbredt ACEC and the Western Rands ACEC. I also discovered many mine features not listed in the TOMS database by the Office of Mine Reclamation. I visited 199 mine features in these two management areas, including 35 adits, 33 shafts, and 131 prospect sites. All my external mine survey data is in the Abandoned Mines Database in three tables: "Adit Visits", "Shaft Visits", and "Prospect Visits".

I identified 18 adits that have high potential for bat habitat. This does not mean that other adits in these management areas (surveyed or not) do not serve as important bat habitat. The following table lists sites where I focused outflight counts during the warm season.

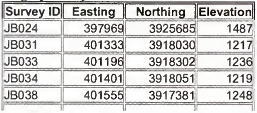
High priority adits



Survey ID	Easting	Northing	Elevation
JB009	395576	3926641	1615
JB010	395562	3926555	1622
JB011	395567	3926619	1621
JB014	396449	3923558	1523
JB016	395377	3923202	1736
JB030	400939	3917838	1204
JB048	401438	3916939	1122
JB085	407376	3905987	649
JB098	407645	3935302	1078
JB164	401423	3916976	1123
JB176	400936	3917848	1256
JB192	389278	3923739	1437
KV004	407552	3936780	1248
KV005	406164	3936518	1226
KV006	406409	3935875	1266
KV007	406298	3935905	1221
WR004	430345	3907968	951
WR015	430314	3908861	869

I identified 18 shafts that have high potential for bat habitat. This does not mean that other shafts in these management areas (surveyed or not) do not serve as bat habitat. The following table lists sites where I focused outflight counts during the warm season.

High priority shafts



Survey ID	Easting	Northing	Elevation
JB024	397969	3925685	1487
JB031	401333	3918030	1217
JB033	401196	3918302	1236
JB034	401401	3918051	1219
JB038	401555	3917381	1248

JB043	402694	3916806	1123
JB057	398384	3916143	1175
JB058	404400	3916237	1108
JB059	404514	3915986	1086
JB060	404508	3915955	1095
JB065	401058	3915857	1156
JB066	400800	3915510	1169
JB073	399954	3914054	1130
JB077	399487	3912676	1077
JB080	404420	3912907	1010
JB086	404969	3905998	884
JB123	395613	3922826	1706
JB137	395449	3927438	1573
JB169	400960	3916974	1204
JB183	404106	3912222	1050
WR003	430650	3908778	856
WR014	430608	3909969	796
WR019	430655	3908787	852

Beginning in June and continuing until October, I conducted outflight counts with a Sony Night-Shot camcorder at a number of the sites listed above. I do not report all of my counts in the Abandoned Mines Database because, as Dr. Pat Brown tells me, "absence of evidence is not evidence of absence". Many of the nights I conducted outflight counts I measured down-canyon wind speeds greater than 20 miles per hour. I never observed bats using a mine when wind speeds were that high. I had few nights with lower wind speeds that I did not observe bats using the mine features I was videotaping.

I report that there were bats observed using the following mine features. The conditions for each survey are detailed in the "Bat Outflight Visits" of the Abandoned Mines Database. Bat activity per five-minute interval is shown in the "Bat Outflight Video Counts" table of the Abandoned Mines Database. Video of each outflight is archived at the Ridgecrest Field Office.

Mines used by bats

Date	Survey ID	Easting	Northing
20031001	JB164	401428	3916974
20031001	JB048	401470	3916897
20030904	JB009	395574	3926644
20030904	JB011	395566	3926618
20030812	JB048	401440	3916942
20030730	JB085	407375	3905986
20030608	JB030	400929	3917837
20030607	KV004	407547	3936772
20030606	WR015	430318	3908865

In addition to outflight counts, I conducted acoustic surveys of bats at water sources in the

Jawbone-Butterbredt ACEC and in Surprise Canyon in the Panamint Mountains. I spent 24 nights at 23 sites recording echolocation calls with an Anabat II bat detector connected to my laptop. Those visits are detailed in the "Survey Nights" table of the Anabat Surveys Database.

I recorded 3,781 calls, which I analyzed in the office. All recordings are listed in the "Calls" table of the Anabat Surveys Database. I identified the species responsible for over 97% of those calls. I am confident that at least six species occur in the Jawbone-Butterbredt ACEC and at least five species in Surprise Canyon. I could not identify the species responsible for 100 calls; these calls might be attributed to additional (possibly rare) species and should be reexamined by a more experienced bat biologist (Pat Brown or Bob Berry). The following table (from the "Species Summary" table in the Anabat Surveys Database) summarizes the species positively identified for each survey at each site.

Species identified by acoustic surveys

SiteDateSpecies NumberANPAEPFUMYCAMYCIPIHETABRMYYU Alphie Canyon200310013NoNoYesNo
YesYesNoAxelson Pond200308146YesYesYesYesYesYesNoBoulder Spring200307133YesNoYesNoYes
NoNoButterbredt Spring200308136YesYesYesYesYesYesNoDove Spring200306152NoNoNoYesYesNoNo
E. Butterbredt Spring200308055NoYesYesYesYesYesNoHorse Canyon Well200306091NoNoNoNoYesNo
NoNudist Spring200308043NoYesYesNoYesNoNoRocky Point200307184NoNoYesYesYesYesNoSage
Canyon Creek200306163YesNoNoYesYesNoNoSage Canyon Spring200308063NoNoYesYesYesNoNo
Shoemaker Spring200307144NoNoYesYesYesYesNoWilliams Spring200308075YesYesNoYesYesYesNo
Willow Spring200307155NoYesYesYesYesYesNoScarlet Canyon200307303NoNoYesNoYesYesNoAlphie
Canyon200308124NoNoYesYesYesYesNoBig Four Mine200309011NoNoNoNoYesNoNoMine JB030
oNoYesNoNoNoNoMine WR015200306062NoNoYesNoYesNoNoSage Canyon Creek200307171NoNoNo
NoYesNoNoUpper Shoemaker200307141NoNoNoNoYesNoNoSurprise Canyon200308114NoYesYesNo
YesYesYesSurprise Canyon200306132NoNoYesNoYesNoYesAxelson House200306055YesNoYesYesYes
YesNoSpecis codes: ANPA = Antrozous pallicus, EPFU = Eptesicus fuscus, MYCA = Myotis californicus, MYCI = Myotis ciliolabrum, PIHE = Pipistrellus hesperus, TABR = Tadarida brasiliensis, MYYU = Myotis yumanensis

I used Dr. Bob Berry's new beta-testing program, "AcousticActivity" to analyze activity patterns per species over the course of the evening for each survey. Activity is summarized per 30-minute interval in the "Activity Summary" table of the Anabat Surveys Database.

Pre-survey Adit Visits: The following adits were visited during the pre-survey to determine the likelihood of their use by bats.

Survey IDEastingNorthingElevationDateTimeWHDStabilityObstructedHumansBS001
385306393500211 9208-Feb-0314:37228unstable30%no signJB0033960453928501172414-Jan-0316:31000stableN/Ano
signJB0043954733927379156016-Jan-0314:17000unstable100%no signJB0093955763926641161516-Jan-0315:122415
stable20%rec. tracks JB0103955623926555162216-Jan-0315:012210stable40%other JB011395567
3926619162116-Jan-0315:072210stable20%old tracks JB0143964493923558152316-Jan-0312:43225unstable90%no
signJB0163953783923202173616-Jan-0311:262210unstable80%old tracks JB020
3956253922796170216-Jan-0310:42000sl. unstable100%no signJB0304009393917838120428-Jan-0314:092210sl.
unstable60%no signJB0474014823916980113028-Jan-0314:49220stable100%no signJB048
4014393916939112228-Jan-0315:222310sl. unstable30%old tracks JB0494014703916897111828-Jan-0315:261030
stable100%no signJB0504015093916825111628-Jan-0316:49000stableN/Ano signJB051
4016693916855115528-Jan-0316:58230stable100%no signJB0534006913916966123528-Jan-0316:13230stable100%no
signJB0713992223914602119815-Jan-0316:52000stable100%no signJB0754004723914251100715-Jan-0316:26000
unstable100%no signJB0854073763905987649 30-Jan-0314:122210sl. unstable30%old tracks JB087
4020123905619118431-Jan-039:03223stable20%other JB0973914263931804114431-Jan-0315:02222stable0%recent
tracks JB0984076453935302107817-Dec-0212:192210stable0%recent entryJB164
4014233916976112328-Jan-0315:192210stable30%old tracks JB1684009823916967120028-Jan-0315:50225sl.
unstable10%old tracks JB1704009563916975120628-Jan-0316:03222stable30%no signJB176
4009363917848125622-Oct-0212:40112stable0%no signJB1903893083923663143531-Jan-0313:05213stable30%rec.
tracks JB1923892783923739143731-Jan-0313:22113stable90%trash outsideJB194
4021293906324126904-Jun-0319:373330unstable10%trash outsideKV0044075523936780124817-Dec-0210:162220
unstable0%recent entryKV0054061643936518122617-Dec-0211:07224sl. unstable80%no signKV006
4064093935875126617-Dec-0211:482210stable0%noneKV0074062983935905122117-Dec-0211:38228stable0%none
WR0044303453907968951 13-Jan-0314:332220sl. unstable40%no signWR0154303143908861869 13-Jan-0313:092230
stable0%recent tracks

Pre-survey Shaft Visits: The following shafts were visited during the pre-survey to determine the likelihood of their use by bats.

Survey IDEastingNorthingElev.DateTimeWidthDepthStabilityObstructedHumansJB005
3954343927382155816-Jan-0314:2000N/AN/AN/AJB02439796939256851487 14-Jan-0315:08615sl. unstable10%rec.
tracks no entryJB0314013333918030121728-Jan-0312:18410sl. unstable0%old tracks enterJB033
4011963918302123628-Jan-0313:33310sl. unstable0%recent tracks enterJB0344014013918051121928-Jan-0312:08410
unstable20%old tracks enterJB0384015553917381124822-Oct-0245stable0%no sign of humansJB043
4026943916806112328-Jan-0311:0748unstable0%old tracks no entryJB0444016953916886117328-Jan-0317:0148sl.
unstable0%trash insideJB0454009943917000120128-Jan-0315:4720stable0%no sign of humansJB046
4009753916971120128-Jan-0315:5328stable10%no sign of humansJB0543981633916621118116-Jan-039:1100
N/AN/AN/AJB0573983843916143117515-Jan-0317:5147unstable80%no sign of humansJB058
4044003916237110829-Jan-0317:3626sl. unstable70%rec. tracks no entryJB059
4045143915986108629-Jan-0317:27312stable0%old tracks no entryJB0604045083915955109529-Jan-0317:22310
stable0%rec. tracks no entryJB0614045603915923108329-Jan-0317:1736sl. unstable0%trash insideJB065
4010583915857115629-Jan-0314:4138sl. unstable40%old tracks no entryJB0664008003915510116929-Jan-0314:54212
stable0%rec. tracks no entryJB0673981263915402126315-Jan-0317:2788sl. unstable90%trash insideJB069
407127391503294630-Jan-0310:0422unstable0%no sign of humansJB0733999543914054113015-Jan-0315:3856
unstable90%no sign of humansJB0773994873912676107715-Jan-0315:0435stable20%old tracks enterJB080
404420391290710103 0-Jan-0312:2638sl. unstable0%no sign of humansJB0864049693905998884 30-Jan-0315:4335
stable0%no sign of humansJB1233956133922826170616-Jan-0310:47210stable0%old tracks no entryJB137
3954493927438157316-Jan-0314:25210stable30%rec. tracks no entryJB1694009603916974120428-Jan-0316:00210sl.
unstable0%no sign of humansJB1834041063912222105030-Jan-0311:0829stable0%no sign of humansJB186
4046713913013101130-Jan-0312:1635sl. unstable0%old tracks no entryWR0034306503908778856 13-Jan-0315:191515
unstable0%no sign of humansWR0144306083909969796 13-Jan-0312:39215stable0%no sign of humansWR016
430354390792894613-Jan-0314:2246stable0%no sign of humansWR0194306553908787852 13-Jan-0315:23315
stable80%no sign of humans

Pre-survey Prospect Visits The following prospects were visited during the pre-survey to determine the likelihood of their use by bats.

Survey IDEastingNorthingElevationDateTimeWidthDepthHumansJB00139577939286331712 14-Jan-0316:4200N/AJB002 39582939286191732 14-Jan-0316:3700N/AJB0063953583927025155 1 16-Jan-0314:4031.5rec. tracks no entryJB007 389938392708711943 1-Jan-0313:4321old tracks no entryJB00839432539265791469 31-Jan-0314:22105no sign of humansJB01239558939265131618 16-Jan-0314:5941.5old tracks no entryJB01339537939260001681 16-Jan-0315:5441 no sign of humansJB01539554639234501617 16-Jan-0311:4041no sign of humansJB017 389245392372514363 1-Jan-0312:5853trash insideJB01838929539236901440 31-Jan-0313:0232.5trash insideJB019 389364392360314393 1-Jan-0313:1330old tracks enterJB02139732339223861520 16-Jan-0313:2500N/AJB023 3980743925870152914-Jan-0315:2540.5recent tracks enterJB0253983973925084143114-Jan-0314:5364no sign of humansJB0264011493918322123828-Jan-0313:3932.5no sign of humansJB0274010573918162123428-Jan-0313:5323 no sign of humansJB0284009733917866121528-Jan-0314:03103no sign of humansJB029 4015023918081121628-Jan-0313:1542.5no sign of humansJB0324013753918036121628-Jan-0312:1332.5trash inside JB0354014493918056122028-Jan-0311:5855no sign of humansJB0364014713918069121728-Jan-0313:2141.5no sign of humansJB0374012173917597118428-Jan-0314:3220no sign of humansJB039 4025653917598115228-Jan-0310:4340.2no sign of humansJB0404040473916911112229-Jan-0316:4230.5no sign of humansJB0414040243916890112429-Jan-0316:4421no sign of humansJB0424033733916922113028-Jan-0311:2232 rec. tracks no entryJB0524015493917002116228-Jan-0314:5522.5no sign of humansJB055 3987083916692122015-Jan-0318:1142.5no sign of humansJB0563987013916634121115-Jan-0318:0541.5rec. tracks no entryJB0624049633915986105529-Jan-0317:5120no sign of humansJB0634048993915830105729-Jan-0318:0020.5no sign of humansJB0644071133915381956 30-Jan-039:3821trash insideJB0684020673914874962 29-Jan-0315:19102 recent tracks enterJB0704076593915001922 30-Jan-039:4910.2no sign of humansJB072 4001293913769109215-Jan-0315:5036no sign of humansJB0744006263914060989 15-Jan-0316:1246no sign of humans JB0764036183913399104930-Jan-0311:5410no sign of humansJB0784035313912695104830-Jan-0311:3843.5trash outsideJB0794041523912278104830-Jan-0311:1320no sign of humansJB0814009353910186842 31-Jan-0311:2150no sign of humansJB0824016213909849806 31-Jan-0311:04107trash insideJB0834015263908942768 31-Jan-0310:4220 recent tracks enterJB0844075363905929637 30-Jan-0313:5520.4old tracks enterJB099 39996239311841329 18-Dec-0212:2030noneJB10140003639311231285 18-Dec-0212:0921noneJB102 39998639310911306 18-Dec-0212:1531.5noneJB1163979763925683148714-Jan-0315:1351no sign of humansJB117 3979783925677148414-Jan-0315:1340.5no sign of humansJB1183999473914065112715-Jan-0315:3742.5no sign of humansJB1194004513914243102815-Jan-0316:2130.5no sign of humansJB1203981363915380126315-Jan-0317:2583 trash insideJB1213986913916646121415-Jan-0318:0752no sign of humansJB1223987013916664121615-Jan-0318:084 0.5no sign of humans JB124 395522 3922817 1713 16-Jan-03 10:52 6 3.5 old tracks enter JB125 395439 3922829 1727 16-Jan-03 10:57 4 0.5 no sign of humans JB126 395393 3922852 1736 16-Jan-03 11:02 4 0.5 no sign of humans JB127 395376 3922863 1743 16-Jan-03 11:03 2 0.5 no sign of humans JB128 395365 3922854 1737 16-Jan-03 11:06 4 0.5 no sign of humans JB129 395329 3922877 1754 16-Jan-03 11:08 7 1 no sign of humans JB130 395370 3923218 1733 16-Jan-03 11:30 6 1 trash inside JB131 395624 3922807 1702 16-Jan-03 12:03 3 1 no sign of humans JB132 395628 3922810 1703 16-Jan-03 12:04 2 1 no sign of humans JB133 396158 3923467 1560 16-Jan-03 12:32 3 0.5 no sign of humans JB134 396184 3923470 1555 16-Jan-03 12:33 7 2 no sign of humans JB135 396447 3923554 1531 16-Jan-03 12:45 6 2 no sign of humans JB136 396455 3923534 1525 16-Jan-03 12:49 5 2 no sign of humans JB138 395578 3926657 1613 16-Jan-03 15:17 4 1 no sign of humans JB139 401433 3918055 1219 28-Jan-03 12:02 4 1.5 trash inside JB140 401428 3918055 1221 28-Jan-03 12:05 4 3 no sign of humans JB141 401369 3918039 1215 28-Jan-03 12:14 15 5 trash inside JB142 401328 3918025 1220 28-Jan-03 12:22 3 2 no sign of humans JB143 401323 3918009 1219 28-Jan-03 12:24 3 1 no sign of humans JB144 401312 3918037 1222 28-Jan-03 12:27 3 1.5 no sign of humans JB145 401307 3918029 1221 28-Jan-03 12:29 4 2 no sign of humans JB146 401304 3918016 1224 28-Jan-03 12:32 15 2.5 trash inside JB147 401272 3918012 1220 28-Jan-03 12:43 3 1.5 no sign of humans JB148 401255 3917991 1216 28-Jan-03 12:46 2 1 no sign of humans JB149 401280 3917956 1217 28-Jan-03 12:49 3 0.5 no sign of humans JB150 401268 3917939 1216 28-Jan-03 12:51 10 2 trash inside JB151 401302 3917999 1219 28-Jan-03 12:55 3 0.5 no sign of humans JB152 401346 3918055 1214 28-Jan-03 12:59 3 1.3 old tracks no entry JB153 401406 3918117 1219 28-Jan-03 13:02 3 1 recent tracks enter JB154 401534 3918075 1212 28-Jan-03 13:10 5 1 no sign of humans JB155 401494 3918077 1213 28-Jan-03 13:17 3 1.5 no sign of humans JB156 401484 3918069 1213 28-Jan-03 13:18 3 1 no sign of humans JB157 400980 3918280 1250 28-Jan-03 13:46 3 1 no sign of humans JB158 400954 3918279 1256 28-Jan-03 13:47 3 1.8 no sign of humans JB159 401191 3917591 1188 28-Jan-03 14:29 2 1.3 no sign of humans JB160 401549 3916997 1164 28-Jan-03 14:57 2 1 no sign of humans JB161 401537 3917011 1154 28-Jan-03 15:12 3 1 no sign of humans JB162 401540 3917040 1149 28-Jan-03 15:13 5 1 no sign of humans JB163 401539 3917045 1151 28-Jan-03 15:14 3 0.7 no sign of humans JB165 401412 3916927 1147 28-Jan-03 15:32 4 2 no sign of humans JB166 401379 3916926 1152 28-Jan-03 15:35 4 2 no sign of humans JB167 401103 3916975 1188 28-Jan-03 15:42 3 1 no sign of humans JB171 400692 3916946 1243 28-Jan-03 16:15 4 1 no sign of humans JB172 400686 3916945 1241 28-Jan-03 16:16 4 2 no sign of humans JB173 400715 3916948 1240 28-Jan-03 16:18 4 1 no sign of humans JB174 401681 3916860 1166 28-Jan-03 17:00 3 1 no sign of humans JB175 400929 3916976 21-Oct-02 4 2 no sign of humans JB177 401005 3917850 1275 22-Oct-02 3 1 rec. tracks no entry JB178 400924 3916976 21-Oct-02 no sign of humans JB179 404955 3915992 1056 29-Jan-03 17:53 2 0.3 no sign of humans JB180 407125 3915380 955 30-Jan-03 9:40 3 1.5 trash inside JB181 407193 3915007 943 30-Jan-03 10:00 2 0.5 no sign of humans JB182 407138 3915013 946 30-Jan-03 10:02 2 0.8 no sign of humans JB184 403677 3912667 1036 30-Jan-03 11:30 2 0.5 no sign of humans JB185 403605 3912657 1043 30-Jan-03 11:35 5 2 trash outside JB187 404673 3912998 1011 30-Jan-03 12:18 2 1 old tracks no entry JB188 407625 3905892 628 30-Jan-03 14:18 2 1 no sign of humans JB189 404382 3906200 953 30-Jan-03 16:04 7 4 no sign of humans JB191 389294 3923677 1444 31-Jan-03 13:19 3 2 old tracks enter JB193 389217 3923763 1435 31-Jan-03 13:25 3 2 trash inside KV001 407766 3936572 1236 17-Dec-02 9:50 4 0.5 no sign of humans KV002 407858 3936496 1209 17-Dec-02 9:40 4 0.5 no sign of humans KV003 407620 3936817 1292 17-Dec-02 10:03 4 2 no sign of humans KV008 406151 3936509 1240 13-Jul-03 21:43 5 3 no sign of humans WR001 430586 3910007 784 13-Jan-03 12:22 3 1.5 no sign of humans WR002 430758 3908418 893 13-Jan-03 15:02 3 1 no sign of humans WR005 430333 3907999 952 13-Jan-03 14:44 0 0 no sign of humans WR006 430228 3907962 988 13-Jan-03 13:48 0 0 no sign of humans WR007 430335 3907934 954 13-Jan-03 14:18 0 0 N/A WR008 430237 3907929 986 13-Jan-03 14:04 0 0 N/A WR009 430311 3907875 967 13-Jan-03 14:12 0 0 N/A WR013 430592 3910012 787 13-Jan-03 12:24 4 1 no sign of humans WR017 430747 3908425 889 13-Jan-03 15:05 3 1 no sign of humans WR018 430764 3908403 898 13-Jan-03 15:08 6 3.5 no sign of humans WR020 430652 3908798 850 13-Jan-03 15:28 3 1 no sign of humans WR021 430664 3908792 852 13-Jan-03 15:30 2 1.5 no sign of humans WR022 430655 3908791 856 13-Jan-03 15:31 2 0.5 no sign of humans WR023 430577 3909123 824 13-Jan-03 15:40 4 1.5 no sign of humans

Bat Outflight Counts: All Features

Date	Survey ID	Easting	Northing	Set-up Time	Take-down Time	Total Out	Total In	Total Net	Video Archived
20031001	JB164	401428	3916974	1905	2035	2	3	-1	TRUE
20031001	JB048	401470	3916897	1850	2024	6	5	1	TRUE
20030904	JB009	395574	3926644	1952	2105	20	29	-9	TRUE
20030904	JB011	395566	3926618	1937	2102	14	17	-3	TRUE
20030812	JB048	401440	3916942	1953	2130	13	14	-1	TRUE
20030730	JB085	407375	3905986	1955	2126	0	1	-1	TRUE
20030608	JB030	400929	3917837	1925	2137	3	3	0	FALSE
20030607	KV004	407547	3936772	1906	2136	1	0	1	FALSE
20030606	WR015	430318	3908865	1836	2113	0	3	-3	FALSE

Anabat Survey: Survey Nights

Site	Date	Easting	Northing	Elev.	Set-up Time	Set-up Sky	Set-up Wind	Set-up Temp	Take-down Time	Take-down Sky	Take-down Wind	Take-down Temp
Alphie Canyon	20031001	401886	3915919	1051	1825	2	2	26				
Big Four Mine	20030910	402140	3906317	1300	1841	0	3	26.5	2036	0	3	19.6
Alphie Canyon	20030812	402008	3915643	1031		1	2	31.6				
Axelson House	20030605	390996	3927659		2007	1	2	29.3	2159	0	0	25.5
Axelson Pond	20030814	390961	3927609	1205		0	2	29.9				
Boulder Spring	20030713	406901	3937552		1935	0	2	30				
Butterbredt Spring	20030812	398922	3915920		1925	2	3	32.5	0100	0	2	
Dove Spring	20030615	400171	3933824		2016	0	3	25.4	2248	0	4	20.6
E. Butterbredt Spring	20030805	400373	3914382	1044	1959	2	2	28.2				
Horse Canyon Well	20030609	406233	3935264		1959	0	4	28.3	2135	0	3	28
Nudist Spring	20030804	407402	3911470	859	2019	0	2	29.3	741	0	2	20.6
Rocky Point	20030718	386596	3937708	960	1945	1	2	29.2	2340	0	1	24.2
Sage Canyon Creek	20030616	404521	3938367		2004	0	3	26	2148	0	3	22.7
Sage Canyon Creek	20030717	404471	3938411	1263		1	2	30.6	2200	0	3	27.3
Sage Canyon Spring	20030806	404635	3938789	1301	2011	1	3	25.3	2331	0	2	20.6
Scarlet Canyon	20030730	407279	3906063	694	1943	0	1	26.6	0049	0	0	26.7
Upper Shoemaker	20030714	394287	3929392		2020	0	1	26	2116	0	0	21.2
Surprise Canyon	20030613	484408	3996445		2016	0	2	31.3	2232	0	0	26.5
Surprise Canyon	20030811	484683	3996456	855	1930	2	2	32.6				
Williams Spring	20030807	392857	3926587	1337	1930	1	0	27.8	738	0	0	17.4
Willow Spring	20030715	393480	3926183		1935	0	1	27.6	2340	1	1	21.7

Anabat Survey: Species Code Summary

Code	Scientific Name	Common Name
Myyu	Myotis yumanensis	Yuma myotis
Epfu	Eptesicus fuscus	big brown bat
Tabr	Tadarida brasiliensis	Mexican free-tailed bat
Myca	Myotis californicus	California myotis
Myth	Myotis thysanodes	fringed myotis
Anpa	Antrozous pallidus	pallid bat
Coto	Corynorhinus townsendii	Townsend's big-eared bat
Pihe	Pipistrellus hesperus	western pipistrelle
Myci	Myotis ciliolabrum	western small-footed myotis
Myvo	Myotis volans	long-legged myotis
Myev	Myotis evotis	long-eared myotis
Mylu	Myotis lucifugus	little brown bat
Euma	Euderma maculatum	spotted bat
Eupe	Eumops perotis	western mastiff bat
Apef	N/A	pallid OR big brown bat

Anabat Survey: Species and Call Time Summary

Site	Date	Species	FirstCall	LastCall
Alphie Canyon	20030812	Myca	2016	2314
Alphie Canyon	20031001	Myca	1920	2343
Alphie Canyon	20030812	Myci	2100	2304
Alphie Canyon	20030812	Pihe	1936	2251
Alphie Canyon	20031001	Pihe	1904	1956
Alphie Canyon	20030812	Tabr	2043	2142
Alphie Canyon	20031001	Tabr	1954	2307
Alphie Canyon	20030812	unknown	2135	2135
Alphie Canyon	20031001	unknown	1940	2228
Axelson House	20030605	Apef	2139	2139
Axelson House	20030605	Myca	2043	2149
Axelson House	20030605	Myci	2039	2146
Axelson House	20030605	Pihe	2015	2148
Axelson House	20030605	Tabr	2047	2047
Axelson House	20030605	unknown	2048	2149
Axelson Pond	20030814	Anpa	2025	2120
Axelson Pond	20030814	Apef	2058	2355
Axelson Pond	20030814	Epfu	2024	2119
Axelson Pond	20030814	Myca	2007	2339
Axelson Pond	20030814	Myci	2008	2354
Axelson Pond	20030814	Pihe	1929	2232
Axelson Pond	20030814	Tabr	2008	2312
Axelson Pond	20030814	unknown	2031	2147
Big Four Mine	20030910	Pihe	2012	2012
Boulder Spring	20030713	Anpa	2101	2233
Boulder Spring	20030713	Myca	2057	2233
Boulder Spring	20030713	Pihe	2107	2151
Butterbredt Spring	20030813	Anpa	2248	2248

Butterbredt Spring	20030813Apef	2046	2346
Butterbredt Spring	20030813Epfu	2126	2346
Butterbredt Spring	20030813Myca	2010	2358
Butterbredt Spring	20030813Myci	2055	2359
Butterbredt Spring	20030813Pihe	1947	2348
Butterbredt Spring	20030813Tabr	2046	2346
Butterbredt Spring	20030813unknown	1949	2154
Dove Spring	20030615Myci	2130	2245
Dove Spring	20030615Pihe	2040	2200
East Butterbredt Spring	20030805Apef	2133	2133
East Butterbredt Spring	20030805Epfu	2039	2306
East Butterbredt Spring	20030805Myca	2006	2
East Butterbredt Spring	20030805Myci	2014	2203
East Butterbredt Spring	20030805Pihe	2005	2232
East Butterbredt Spring	20030805Tabr	2043	2314
East Butterbredt Spring	20030805unknown	2019	2320
Horse Canyon Well	20030609Pihe	2046	2104
Mine JB030	20030608Myca	2038	2038
Mine KV004	20030607Myca	2106	2106
Mine WR015	20030606Myca	2047	2055
Mine WR015	20030606Pihe	2023	2047
Mine WR015	20030606unknown	2026	2026
Nudist Spring	20030804Epfu	2317	2317
Nudist Spring	20030804Myca	2023	2046
Nudist Spring	20030804Pihe	2014	2036
Rocky Point	20030718Myca	2126	2137
Rocky Point	20030718Myci	2119	2319
Rocky Point	20030718Pihe	2011	2335
Rocky Point	20030718Tabr	2035	2035
Rocky Point	20030718unknown	2115	2240
Sage Canyon Creek	20030616Apef	2113	2115
Sage Canyon Creek	20030616Myci	2054	2116
Sage Canyon Creek	20030616Pihe	2024	2106
Sage Canyon Creek	20030717Pihe	2024	2116
Sage Canyon Creek	20030717unknown	2130	2200
Sage Canyon Spring	20030806Myca	2203	2203
Sage Canyon Spring	20030806Myci	2116	2330
Sage Canyon Spring	20030806Pihe	2019	2021
Scarlet Canyon	20030730Myca	2028	2304
Scarlet Canyon	20030730Pihe	2005	2329
Scarlet Canyon	20030730Tabr	2145	2343
Scarlet Canyon	20030730unknown	2130	2338
Shoemaker Spring	20030714Apef	2144	2150
Shoemaker Spring	20030714Myca	2143	2144
Shoemaker Spring	20030714Myci	2143	2203
Shoemaker Spring	20030714Pihe	2143	2155
Shoemaker Spring	20030714Tabr	2144	2149
Shoemaker Spring	20030714unknown	2150	2152

Surprise Canyon	20030613Anpa	2219	2219
Surprise Canyon	20030811Apef	2039	2318
Surprise Canyon	20030811Epfu	2211	2325
Surprise Canyon	20030613My50	2056	2105
Surprise Canyon	20030811My50	2137	2137
Surprise Canyon	20030613Myca	2039	2230
Surprise Canyon	20030811Myca	2005	13
Surprise Canyon	20030613Myyu	2055	2224
Surprise Canyon	20030811Myyu	2042	2238
Surprise Canyon	20030613Pihe	2042	2229
Surprise Canyon	20030811Pihe	1943	13
Surprise Canyon	20030811Tabr	2143	2325
Surprise Canyon	20030613unknown	2102	2102
Surprise Canyon	20030811unknown	2102	10
Upper Shoemaker Spring	20030714Pihe	2032	2032
Upper Shoemaker Spring	20030714unknown	2037	2046
Williams Spring	20030807Anpa	2040	2040
Williams Spring	20030807Epfu	2019	2026
Williams Spring	20030807My40	2010	2010
Williams Spring	20030807Myci	2020	2336
Williams Spring	20030807Pihe	1946	2100
Williams Spring	20030807Tabr	2007	2026
Williams Spring	20030807unknown	2020	2040
Willow Spring	20030715Epfu	2052	2237
Willow Spring	20030715Myca	2041	2318
Willow Spring	20030715Myci	2042	2326
Willow Spring	20030715Pihe	2024	2325
Willow Spring	20030715Tabr	2035	2258
Willow Spring	20030715unknown	2054	2321